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13.ABSTRACT (Maximum 200 words) THIS IS A PROGRESS REPO CURRENTLY UNDERWAY (E.G TESTS). TWO SETS OF LY EXPERIMENTS DESIGNED TO	., PLANT GROWTH & SIMETERS HAVE BEEN	DIMP & DCPD LYSI UTILIZED IN A S	METER ERIES OF

THE DRAINAGE SAMPLES FROM THE GROUP 2 LYSIMETERS HAVE BEEN TERMINATED. ANALYSIS OF THE 1, 8 AND 20 PPM DIMP EXPOSED PLANTS FROM THE SOIL GROWTH TESTS IS PARTIALLY COMPLETE.

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AEROJET ORDNANCE AND MANUFACTURING COMPANY 9236 East Hall Road Downey, California 90241

DETERMINATION OF DECONTAMINATION CRITERIA

DIMP AND DCPD (U)

Report No. 1953-01(20)MF

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▼ - Satisfactory Progress - on schedule

Determination of Decontamination Criteria - DIMP and DCPD Research Task Schedule

Progress on items proposed for action during March 1977, is discussed in this report.

Full Scale Lysimeter Tests

Two sets of lysimeters have been utilized in a series of experiments designed to study the mobility of DIMP (disopropyl methyl phosphonate) in various types of soil. The five types of soil used and their source locations are:

Chino = sandy clay loam

Brawley - silty clay

Ventura - clay loam

Fullerton - sandy loam

Walnut - clay loam

These soils were dried, screened and repacked into five foot deep steel cylinders, epoxy coated on the inside and fitted at various depths with porous ceramic tensiometers for sampling the ground water. Group I was a series of five lysimeters chronically exposed to irrigation with 20 ppm DIMP in distilled water. This series was terminated last month. Group 2 was another series of 5 lysimeters in which the top I foot depth of soil was intimately mixed with DIMP to a concentration of 20 ppm and regular additions of 2 inches (12, 887 ml) of distilled water were added to the surface and allowed to percolate down through the soil. This percolating water as well as the soil itself was sampled at various depths to follow the progress of the DIMP through the soil.

Table 1 shows data from two of the final four core samples from the group 1 lysimeters. There is some variation between sample 1 and sample 2. These will be combined with data from the other terminal core samples as it becomes available.

Table 1

DIMP Content of Soil Samples (ppm) 426 Days

Group 1

Depth	: Ventura	Chino	Fullerton	Walnut	Brawley
0 (surface)	(1) (2) 22.0 - 22.4	(1) (2) 38.3 - 27.4	(1) (2) 21.3 - 23.7	(1) (2) 49.0 - 26.2	(1) (2) 14.8 - 8.6
0 - 6"	5.7 - 3.1	8.5 - 7.4	6.8 - 3.9	16.2 - 6.2	* - 5.9
6 - 12"	3.8 - 3.0	6.4 - 7.1	6.8 - 3.9	6.9 - 5.2	* - 5.6
12 - 18"	1.5 - 1.5	5.5 - 6.1	6.3 - 3.1	6.2 - 3.8	6.9 - 6.4
18 - 24"	3.2 - 2.1	4.6 - 3.8	4.0 - 3.1	4.5 - 3.8	4.5 - 8.0
24 - 3011	1.4 - 2.6	3.4 - 6.4	4.4 - 3.3	5.4 - 5.1	6.4 - 6.8
30 - 3611	0.8 - 2.2	3.0 - 1.2	6.2 - 2.9	5.5 - 5.1	6.2 - 4.8
36 - 42"	1.6 - 2.3	4.9 - 1.7	6.0 - 2.0	6.7 - 4.1	5.0 - 5.2
42 - 4811	1.7 - 2.6	2.6 - 1.6	5.1 - 2.4	5.5 - 4.4	5.7 - 3.7
48 - 54"	1.7 - 2.3	2.6 - 2.0	3.1 - 3.4	5.2 - 4.2	4.3 - 4.2
54 - 60"	2.0 - 3.7	* - 10.6	5.1 - 2.5	4.1 - 7.4	4.3 - 4.2

^{* 0.1} ppm

The drainage samples from the group 2 lysimeters have been terminated also. The final samples were taken at 322 days. The drainage ratios (volume of water recovered divided by the volume of water added) of all the group 2 samples have been plotted up to date on Figures 1 and 2. The data from the soil core samples of group 2 at 322 days is shown in Table 2. The tensiometer water samples taken at 315 days gave the results shown in Table 3.

Multiple soil core samples, four series from each lysimeter in both group 1 and group 2, have been taken and are being analyzed. The purpose of the multiple sampling is to diminish the horizontal inhomogeneities in the final set of data.

The average drainage ratios of the group 2 lysimeters over the entire test period are shown in Table 4.

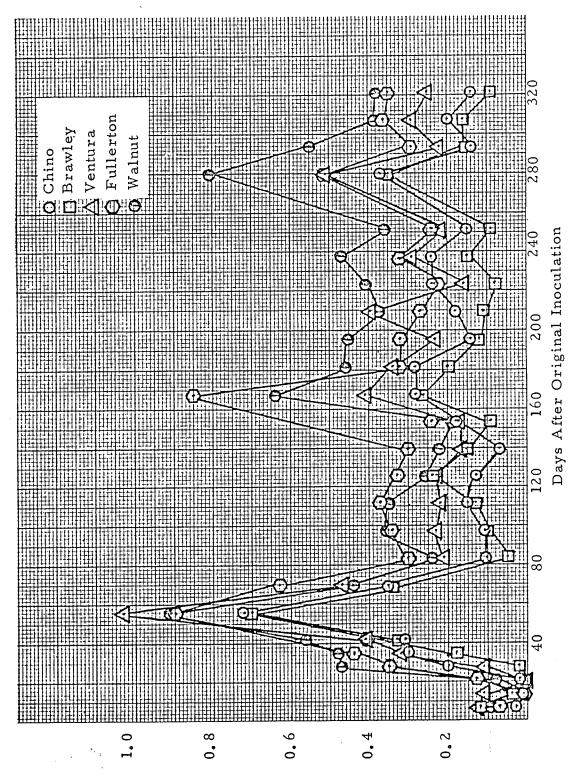
Table 4

Average of Drainage Ratios After 322 Days

Group 2

Soil Type	Avg. Drainage Ratio
Sandy Clay Loam	0.20
Silty Clay	0.17
Clay Loam	0.28
Sandy Loam	0.36
Clay Loam	0.40
	Sandy Clay Loam Silty Clay Clay Loam Sandy Loam

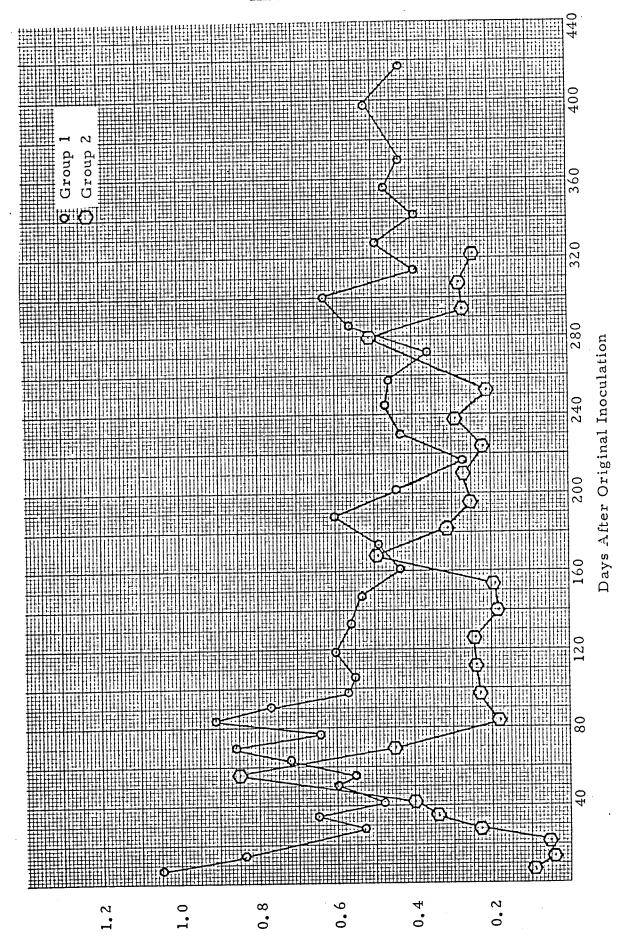
Mean = 0.28



Drainage Ratios of Various Soils in Full Scale Lysimeters

Group 2

Drainage Ratio (volume out - volume in)



Drainage Ratios of Various Soils in Full Scale Lysimeters Average of All Samples Within the Groups Figure 2.

Table 2

DIMP Content of Soil Samples (ppm) (322 Days)

Group 2

Depth	Ventura.	Chino	Fullerton	Walnut	Brawley
0 (surface)	*	*	*	*	*
0 - 6	*	*	*	*	*
6 - 12"	*	*	*	*	*
12 - 18"	*	*	*	*	*
18 - 24"	- ; {c	*	*	*	^{પ્ર} લ
24 - 30"	0.6	2.9	*	×κ	6.5
30 - 36"	1.7	4.8	*	*	24.1
36 - 42"	3.4	6.2	5.0	**	14.8
42 = 4811	6.6	9.1	12.7	0.8	6.7
48 - 54"	14.5	5.0	10.3	4.1	1.1
54 - 60"	12.3	2.3	6.3	6.2	*

Table 3

DIMP Content of Tensiometer Water Samples (ppm) (315 Days)

Group 2

Depth	Ventura	Chino	Fullerton	Walnut	Brawley
6"	*	*	*	*	*
18"	*	13.0	*	*	2.9
30"	9.3	46.2	21.8	12.2	58.6
42"	72.2	***	33.7	15.9	18.2
54"	39.5	24.6	31.1	61.5	*
60''	**	2.2	45.4	*	*
	·		* . *		

^{* 0.1} ppm

^{**} No sample

These averages are somewhat lower than similar averages for the group 1 samples. One possible reason for this is that the group 2 lysimeters were in a relatively less protected area than the group 1 units which could have resulted in a greater evaporation rate of the standing water.

Soil Culture Experiments

Analyses of the 1, 8 and 20 ppm DIMP exposed plants from the soil growth tests is partially complete. Results from some of the analyses are shown in Tables 5a, 5b and 5c. As noted in previously analyzed species the soil grown plants, in general, show much less bioconcentration than do the hydroponically grown samples possibly due in great part to the hindered mobility of the test compounds. Figures 3, 4 and 5 show this data graphically.

Harvesting of the broad range (50-1000 ppm) soil growth tests is essentially complete. Yield data from these plants is currently being determined.

Table 5(a)

Bioconcentration of DIMP by Plant Parts (Terminal) in 20 ppm Irrigation

	 		· · · · · · · · · · · · · · · · · · ·		I
	Total Added		Days	DIMP	
	Vol. of	Wt. of	From	Conc. in	
Plant	20 ppm	DIMP	Orig.	Tissue	Bioconcentration
Part	Irr.(cc)	(mg)	Inoc	(ppm)	Factor
Sugar Beet	49,300	986	196		
Root				11	0.6
Stem	1			-	
Leaf				65	3.3
Carrot	52,700	1054	225		
Root			·	13	0.7
Stem	}		'	27	1.4
Leaf				69	3.5
Bean	17,100	342	65		
Root				81	4.1
Stem		•		63	3.2
Leaf			·	121	6.0
Wheat	17, 100	342	65		
•			·	22	1.1
Root Stem			,	10	0.5
Leaf				106	5.3
цеаг		•		100	3.3
Alfalfa	23,400	468	115		
Root				5	0.3
Stem				* .	₩.
Leaf				24	1.2
	1	_			

None detected No sample

Table 5 (b)

Bioconcentration of DIMP by Plant Parts (Terminal)

in
8 ppm Irrigation

Total DIMP		 		r	,	
Plant Part 20 ppm Irr.(cc) DIMP (mg) Orig. Inoc Tissue (ppm) Bioconcentration Factor Sugar Beet 49,300 394 196 394 196 394 394 394 196 394 3		ì	to Pot		j	
Part Irr.(cc) (mg) Inoc (ppm) Factor Sugar Beet 49,300 394 196 394 196 394 196 394 196 394 394 196 394 394 196 394 <td></td> <td>1</td> <td>·</td> <td></td> <td>•</td> <td></td>		1	·		•	
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Root 11 1.4 5tem 6 0.8	Leaf	•			86	10.7
Stem 6 0.8	Alfalfa	23,400	184	115		
Stem 6 0.8	Root				11	1 . 4 .
Leaf 21 2.6	Stem				6	
	Leaf				21	
	·					
						· .
		, ⁴ 1 ;				

^{* &}lt;0.1 ppm

Table 5(c)

Bioconcentration of DIMP by Plant Parts (Terminal) in 1 ppm Irrigation

Plant Part	Total: Added Vol. of 20 ppm Irr.(cc)		Days From Orig. Inoc	DIMP Conc. in Tissue (ppm)	Bioconcentration Factor
Sugar Beet	49,300	49	196		
Root Stem Leaf				* - 1	1
Carrot	52,700	53	225		
Root Stem Leaf				1 1 10	1 1 10
Bean	17,000	17			
Root Stem Leaf				9 1 3	9 1 3
Wheat	17,100	17			
Root Stem Leaf				4 4 *	4 4 ~
Alfalfa	23,400	23	115	·	
Root Stem Leaf				* * *	~ - -

^{* &}lt; 0.1 ppm

⁻ No sample

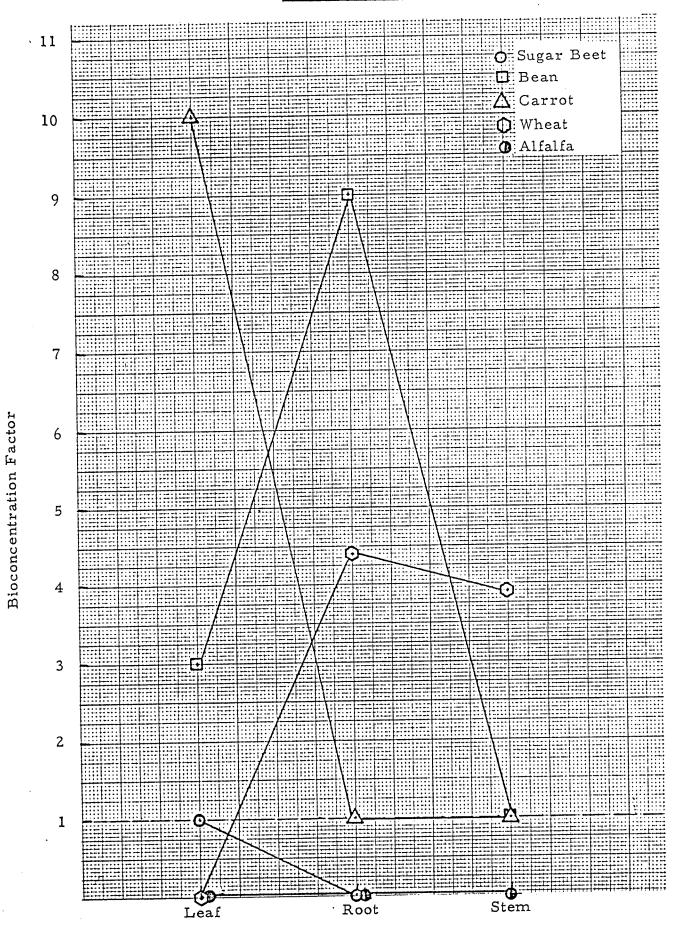


Figure 3. Bioconcentration of DIMP by Plant Parts. Soil Culture, Exposure to 1 ppm DIMP in Irrigation Water

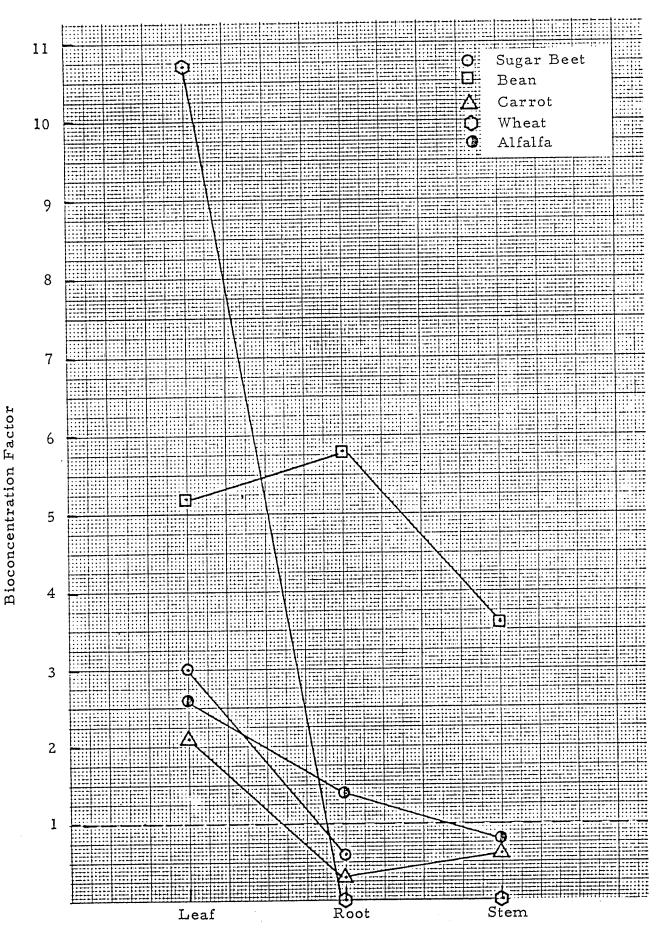


Figure 4. Bioconcentration of DIMP by Plant Parts.
Soil Culture, Exposure to 8 ppm DIMP in Irrigation Water

Bioconcentration Factor

Figure 5. Bioconcentration of DIMP by Plant Parts. Soil Culture, Exposure to 20 ppm DIMP in Irrigation Water.

PROPOSED ACTIVITY FOR APRIL 1977

- Harvest and weigh plants from the range finding soil growth experiments to determine effective dose levels of contaminants.
- Continue radioactive DIMP and DCPD in soil evaporation/
 decomposition experiments.
- Continue ancillary analyses on soil and tissues from growth tests terminated in December.
- Analyze group 1 and group 2 multiple terminal lysimeter samples.